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The immature stages of *Lobesia* Guenée (Lepidoptera, Tortricidae) from Japan*

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Abstract The larvae and pupae of three species of Japanese *Lobesia* Guenée, *L. virulenta* Bae & Komai, *L. aeolopa* Meyrick and *L. coccophaga* Falkovitsh are described and illustrated.

Key words Tortricidae, Olethreutinae, *Lobesia*, immature stages, Japan.

The genus *Lobesia* is one of the complicated groups belonging to the subfamily Olethreutinae. The larvae feed on needle- to broad-leaf trees, and some species are known as important agricultural pests. MacKay (1959) treated the North American members of Olethreutidae (=Olethreutinae), and pointed out the importance of the shape of head and anal shield of the larvae as well as the chaetotaxy and the proportion of the spinneret. In Europe, Bovey (1966) studied detail ecology of *L. botrana*, which is an important pest injuring grapes. Bradley *et al.* (1979) gave biology involving feeding habit and morphology of five British species. In Japan, brief biological notes have been reported several times (Issiki & Mutuura, 1962; Fukuda, 1974; Suzuki & Komai, 1984; Kodama, 1988; Bae & Komai, 1991), but morphological study of the immature stages, which seems to be essential for systematics of this group, has been poor in substance.

The markings on the prothoracic shield of larvae and the number and shape of the dorsal spines of pupae are important characters which distinguish species or provide its phylogenetic relationships.

In the present paper, descriptions of the mature larvae and pupae of three Japanese species are given. Two are agricultural pests; *L. virulenta*, mainly attacking Japanese pear and *L. aeolopa*, attacking tea, kiwi fruit and grape. The other, *L. coccophaga*, feeds on flowers and leaves of honeysuckle (*Lonicera japonica* Thunb.).

Lobesia (Lobesia) virulenta Bae & Komai
(Figs. 1, 4, 7, 12, 14a-b, 22a-b, 23, 30)

Lobesia (Lobesia) virulenta Bae & Komai, 1991.

Mature larva (Figs. 1, 4, 7, 12, 14a-b). Head width: 0.75 mm. Body length: 8-12 mm.

Color pattern—Head (Fig. 1) light yellowish brown, with distinct black ocellar area; lateral bar on cheek black. Prothoracic shield (Fig. 12) dark reddish brown. Anal shield (Fig. 14a) dark brownish gray, irrorated with black. Thoracic legs black or dark reddish brown with light brownish claws. Body dark brown or black. Setal pinacula (Fig. 12) somewhat darker than body color. Peritreme of spiracles black.

Structure—Head (Figs. 1, 4, 7). Slightly broader than long. Labrum as illustrated in Fig. 4. Mandible (Fig. 7) with five teeth. Clypeus longer than wide. Adfrontals nearly

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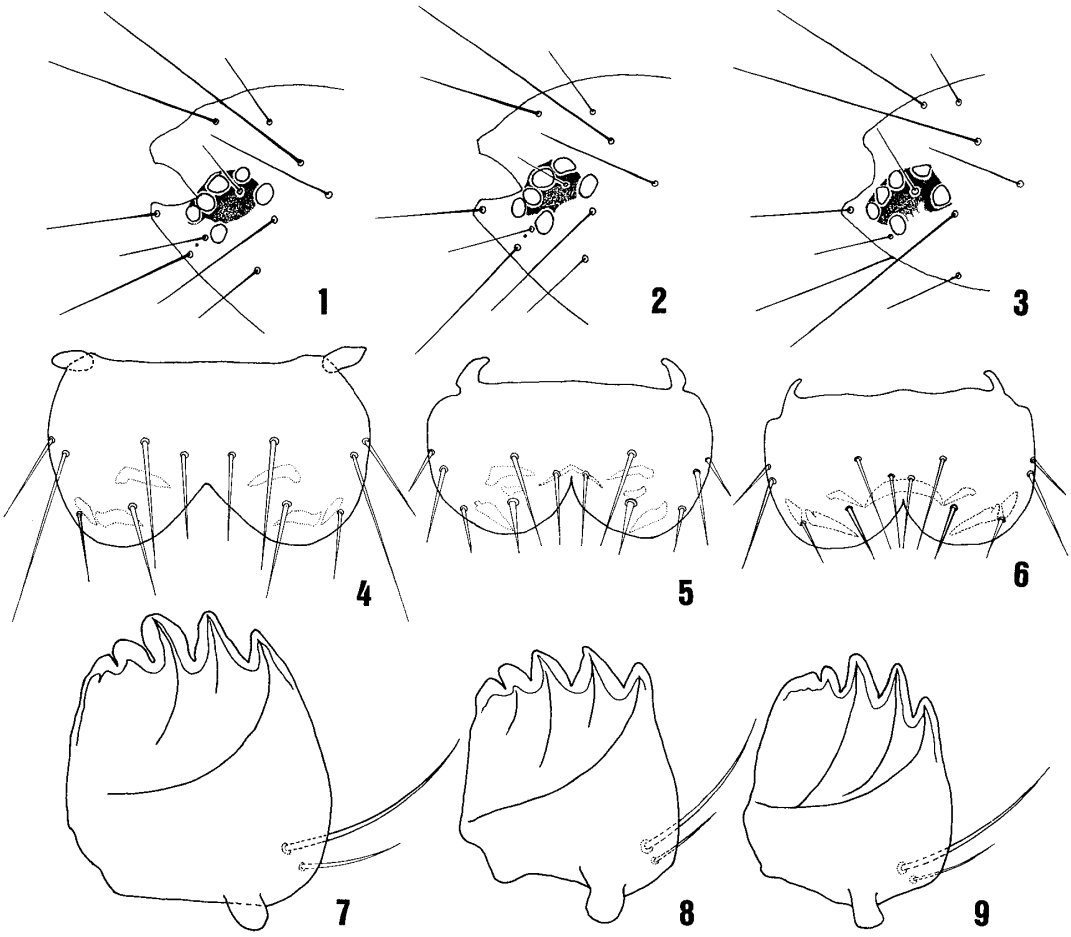
extending vertical triangle. O1 equidistant from ocelli I and III; O2 ventro-caudal to ocellus I.

Thorax (Fig. 12). Prothoracic spiracle circular. SD1 usually equidistant from SD2 and XD2; L1 closer to L2 than to L3, slightly below and long than L2 and L3. D1 on meso- and metathorax usually slightly postero-dorsal to D2.

Abdomen (Fig. 14a). SD1 on 8th segment anterior to spiracle. L1 and L2 distinctly anterior to a vertical line through spiracle except on 1st segment. SV group on 1st, 2nd, 7th, 8th and 9th segments numbering respectively 3 : 3 : 3 : 2 : 2; SV3 usually antero-lateral and SV2 postero-mesal to SV1 on 1st and 2nd segments. D2 on both sides of 9th segment usually on the same pinaculum; D1 and SD1 on the same pinaculum; V1 about the same distance, apart as those on 8th segment. Spiracle rounded, moderately small; spiracle on 8th segment twice as large as that of 7th segment. Anal shield (Fig. 14a) rounded posteriorly in dorsal view with spotted markings; L1 about the same distance apart as D1; anal fork (Fig. 14b) usually with 6 prongs.

Prolegs short, with crochets 34-47 in biordinal circle, anal prolegs with 28-30 crochets in partially uniordinal semicircle.

Material examined. 3 exs. Tottori City, Tottori Pref. (H. Fukuda), feeding on young fruit



Figs. 1-9. Heads and mouth parts of mature larvae: 1, 4, 7. *Lobesia* (*Lobesia*) *virulenta* Bae & Komai; 2, 5, 8. *L.* (*L.*). *aeolopa* Meyrick; 3, 6, 9. *L.* (*Neolobesia*) *coccophaga* Falkovitsh. 1-3. Lateral view of ocellar region; 4-6. Dorsal view of labrum; 7-9. Ventral view of left mandible.

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of *Pyrus serotina* Rehder var. *culta* Rehder, fixed on 30. VI. 1988, in Entomological Laboratory, University of Osaka Prefecture (UOP).

Pupa (Figs. 22a-b, 23). Length 7 mm ; width 2 mm. Uniformly yellowish brown in color. Structure as in normal tortricid pupae. Second to 8th abdominal segments with two rows of spines dorsally, its posterior row weak as in Fig. 22a. Dorsal spines of the anterior row on 3rd abdominal segment between D1s with 4 spines (Fig. 22a-b). Postero-lateral process absent.

Material examined. 1 ♂ 2 ♀, Funaoka, Tottori Pref. em. 3. VII. 1971. (H. Fukuda), reared from larvae on *Pyrus serotina* var. *culta* ; 1 ♀, Tottori City, Totorri Pref. (H. Fukuda), reared from larvae on young fruit of *P. serotina* var. *culta*, fixed on 9. VII. 1988, in UOP.

Host plants. *Larix leptolepis* (Sieb. & Zucc.) Gordon ; *Pyrus serotina* Rehder var. *culta* Rehder (Japanese pear) ; *Angelica* sp. ; gall of *Ceratovacuna nekoashi* (Sasaki) on *Styrax japonicus* Sieb. & Zucc. (Bae and Komai, 1991).

Lobesia (Lobesia) aeolopa Meyrick
(Figs. 2, 5, 8, 13, 15a-b, 17-21, 26-29)

Lobesia aeolopa Meyrick, 1907.
Lobesia proterandra Meyrick, 1921.
Lobesia dryopelta Meyrick, 1932.
Lobesia eustales Bradley, 1956.

Mature larva (Figs. 2, 5, 8, 13, 15a-b, 26, 28, 29). Head width : 0.82-0.88 mm. Body length : 8-12 mm.

Color pattern—Head (Fig. 2) light brown, with distinct black ocellar area ; lateral bar on cheek reddish brown.

Prothoracic shield dark reddish brown. Anal shield (Fig. 15a) dark brownish gray, irrorated with black. Thoracic legs black or dark reddish brown with light brownish claws. Body light brown to dark brownish gray. Setal pinacula (Fig. 13) somewhat lighter than body color. Peritreme of spiracles dark brownish.

Structure—Head (Figs. 2, 5, 8). Slightly broader than long. Labrum as illustrated in Fig.5. Mandible (Fig. 8) with five teeth. Clypeus longer than wide. Adfrontals nearly extending to vertical triangle. O1 equidistant from ocelli I and III ; O2 ventro-caudal to ocellus I.

Thorax (Fig. 13). Prothoracic spiracle circular. SD1 usually equidistant from SD2 and XD2 ; L1 closer to L2 than to L3, slightly below and long than L2 and L3. D1 on meso- and metathorax usually slightly postero-dorsal to D2.

Abdomen (Fig. 15a-b). SD1 on 8th segment anterior to spiracle. L1 and L2 distinctly anterior to a vertical line through spiracle except on 1st segment. SV group on 1st, 2nd, 7th, 8th and 9th segments numbering respectively 3 : 3 : 3 : 2 : 2, with SV3 usually antero-lateral and SV2 postero-mesal to SV1 on 1st and 2nd segments. D2 on both sides of 9th segment usually on the same pinaculum ; D1 and SD1 on the same pinaculum ; V1 about the same distance, apart as those on 8th segment. Spiracle rounded, moderately small ; spiracle on 8th segment 1.5 times as large as that of 7th segment. Anal shield (Fig. 15a) rounded posteriorly in dorsal view, with spotted markings. L1 about the same distance apart as D1. Anal fork (Fig. 15b) usually with 6 or 7 prongs.

Prolegs short, with crochets 32-34 in biordinal circle, anal prolegs with 20-22 crochets in partially uniordinal semicircle.

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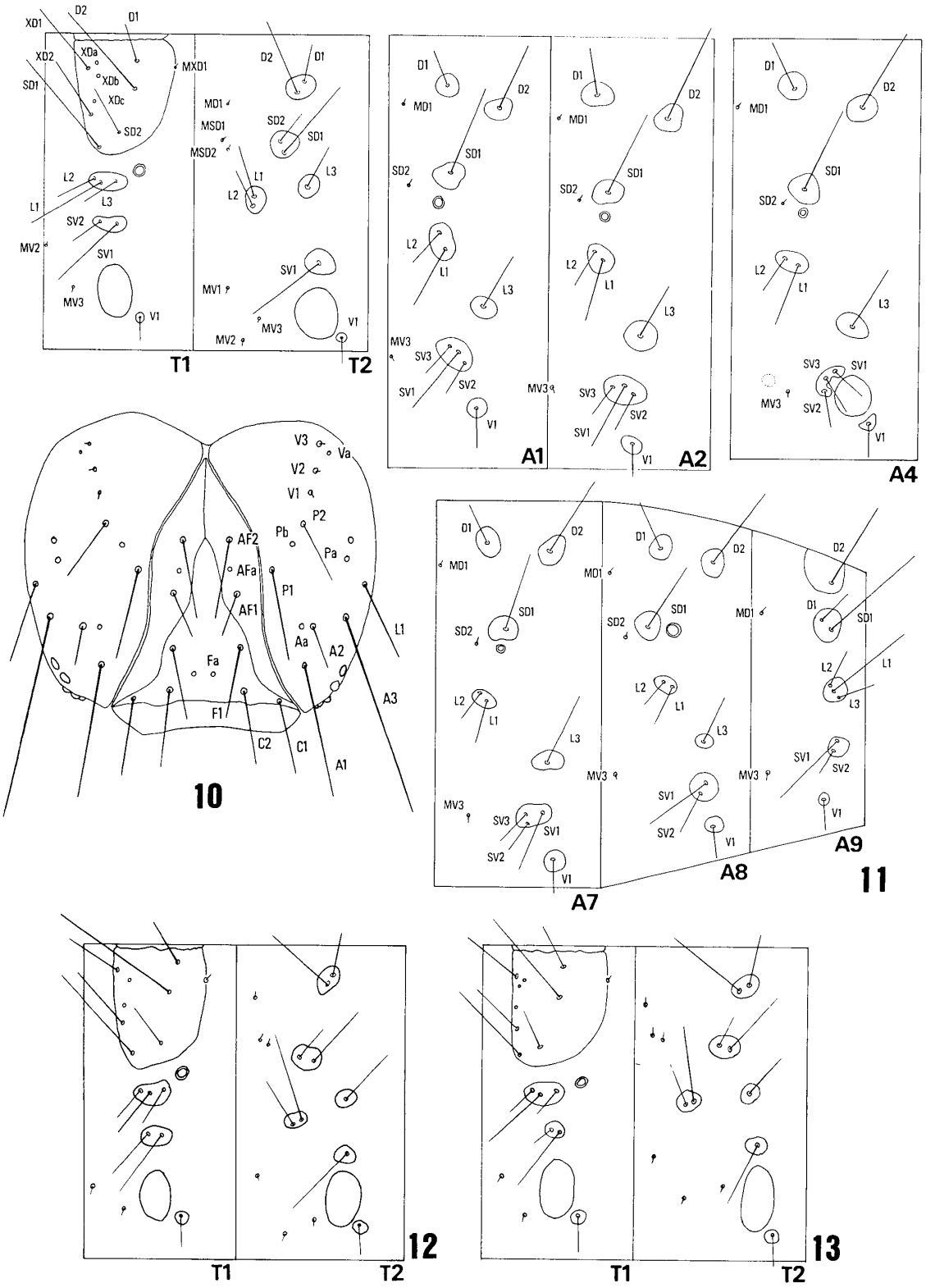

Figs. 10-13. Chaetotaxy of the mature larvae. 10, 11. *Lobesia* (*Neolobesia*) *coccophaga* Falkovitsh; 12. *L.* (*Lobesia*) *virulenta* Bae & Komai; 13. *L.* (*L.*) *aeolopa* Meyrick.

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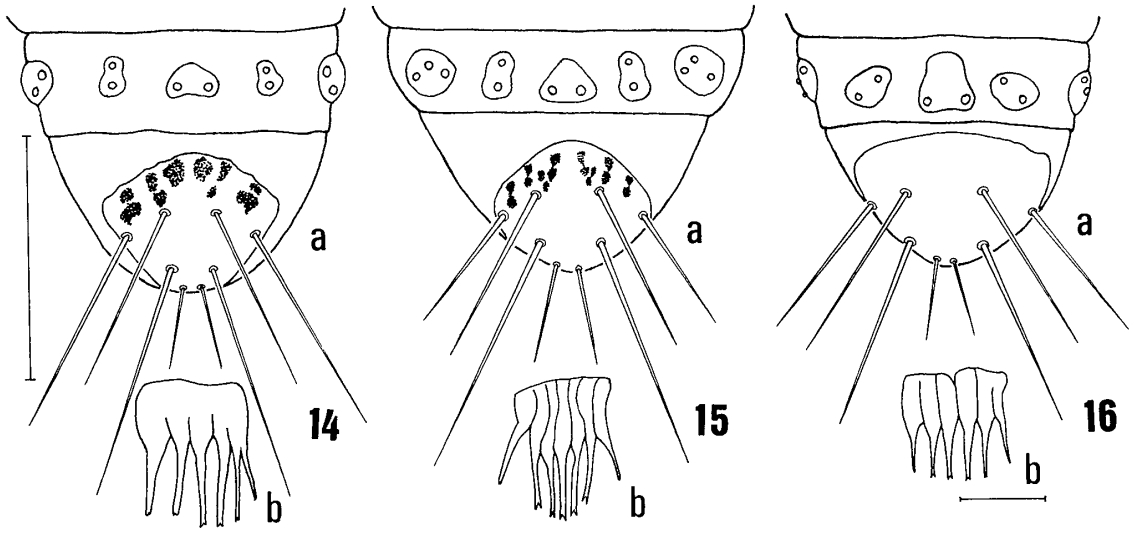

Figs. 14-16. Mature larvae of *Lobesia* spp., a. Dorsal view of 9th and 10th abdominal segments, b. Anal fork. 14. *L.* (*Lobesia*) *virulenta* Bae & Komai; 15. *L.* (*L.*) *aeolopa* Meyrick; 16. *L.* (*Neolobesia*) *coccophaga* Falkovitsh.

Material examined. 8 exs. Sakai City, Osaka Pref. (T. Yasuda & Y. S. Bae), feeding on *Thea sinensis* L., fixed on 22. III-8. IV. 1988, in UOP; 2 exs, Hirai-Cho, Izumi City, Osaka Pref. (Y. S. Bae), feeding on *T. sinensis*, fixed on 6. IV. 1988, in UOP.

Pupa (Figs. 17-19, 20a-b, 21). Length 5-8 mm; width 2 mm. Color light brown to dark brown. Structure as in normal tortricid pupae. Abdomen with two rows of spines dorsally, its posterior row weak on 2nd-8th abdominal segments as in Fig. 20a. Dorsal spines of the anterior row on 3rd abdominal segment between D1s with 5-7 smooth spines (Fig. 20a-b). Postero-lateral process small.

Material examined. 1 ♂ 3 ♀, Sakai City, Osaka Pref. (T. Yasuda & Y. S. Bae), reared from larvae on *T. sinensis*, fixed on 19. IV. 1988, in UOP; 1 ♂ 1 ♀, Hirai-cho, Izumi City, Osaka Pref. (Y. S. Bae), reared from larvae on *T. sinensis*, fixed on 12. IV. 1988, in UOP.

Host plants. Japan: *Ulmus parvifolia* Jacquin, *Eriobotrya japonica* (Thunb.) Lindley, *Prunus* x *yedoensis* Matsumura, *Albizzia julibrissin* Durazzini, *Glochidion hongkongense* Muell.-Arg., *Vitis, Diospyros kaki* Thunb., *Thea sinensis* L. (Bae and Komai, 1991); *Actinidia chinensis* Planch, var. *hispida* C. F. Liang (Kiwi fruit) (Kodama, 1988).

Lobesia (Neolobesia) coccophaga Falkovitsh
(Figs. 3, 6, 9-11, 16a-b, 24a-b, 25, 31)

Lobesia coccophaga Falkovitsh, 1970.

Mature larva (Figs. 3, 6, 9-11, 16a, b). Head width: 0.75-0.87 mm. Body length: 8-12 mm.

Color pattern—Head (Figs. 3, 10) light yellowish brown, with distinct black ocellar area; lateral bar on cheek black. Prothoracic shield (Fig. 11) yellowish green or dark yellow. Anal shield (Fig. 16a) green. Thoracic legs creamy white with pale grayish bands on each segment, with light brownish claws. Body yellowish green to light blue green. Setal pinacula (Fig. 11) somewhat darker than body color. Peritreme of spiracles black.

Structure—Head (Figs. 3, 6, 9, 10). Slightly broader than long. Labrum as illustrated

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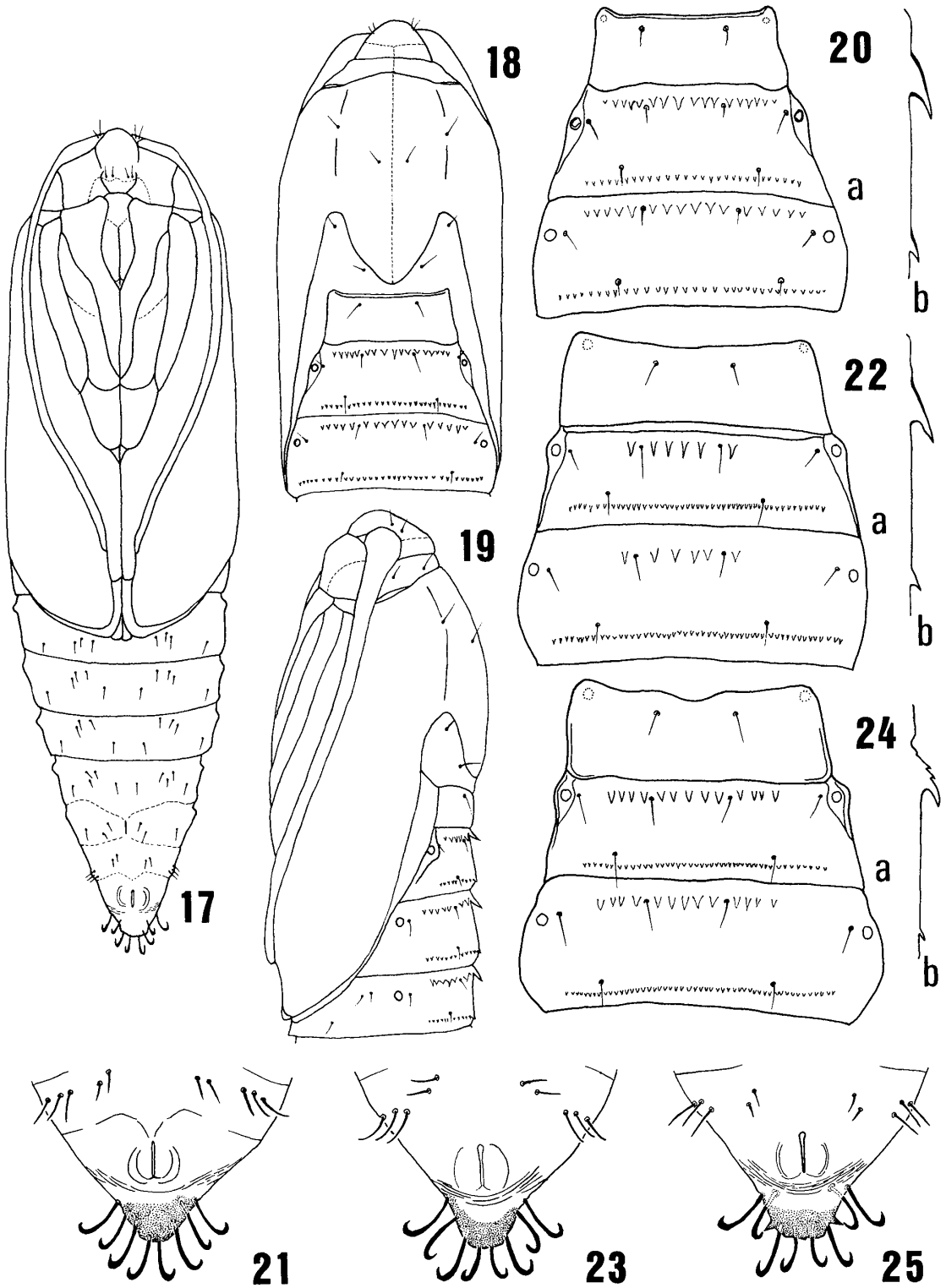

Figs. 17-25. Pupae of *Lobesia* spp.: 17-21. *L.* (*Lobesia*) *aeolopa* Meyrick; 22, 23. *L.* (*L.*) *virulenta* Bae & Komai; 24, 25. *L.* (*Neolobesia*) *coccophaga* Falkovitsh. 17. Ventral aspect, female; 18. Dorsal aspect of head and thorax, female; 19. Lateral aspect of head and thorax, female; 20a, 22a, 24a. Dorsal aspect of 1st to 3rd abdominal segments; 20b, 22b, 24b. Lateral aspect of spines on dorsum of 4th abdominal segment; 21, 23, 25. Ventral aspect of terminal abdominal segments, female.

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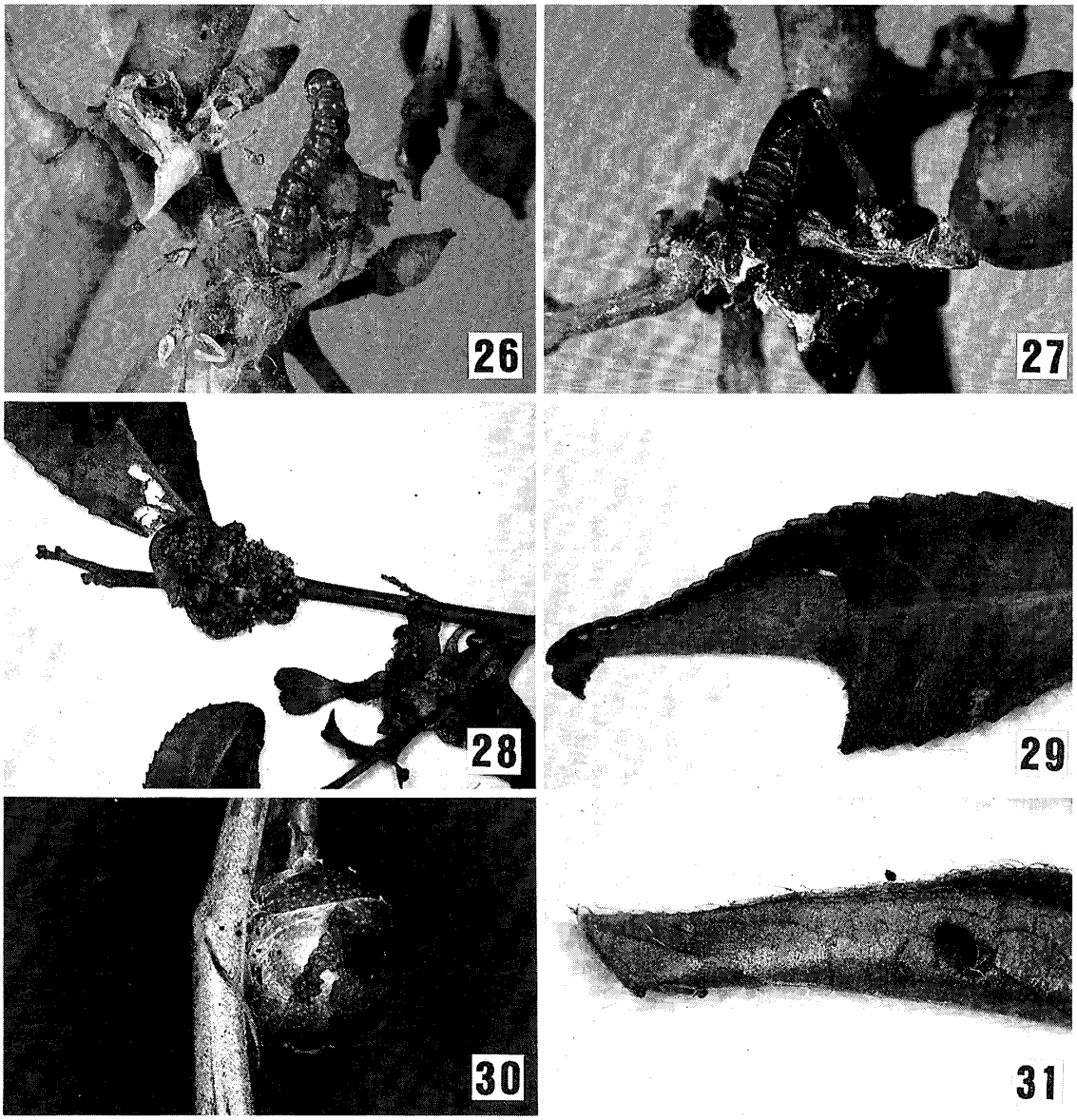

Figs. 26-31. Larvae and Pupae of *Lobesia* spp. 26. *L.* (*Lobesia*) *aeolopa* Meyrick; larva on stem of grape. 27. *L.* (*L.*) *aeolopa* Meyrick; pupa on stem of grape. 28. *L.* (*L.*) *aeolopa* Meyrick; larva and pupa in withered flowers of green tea. 29. *L.* (*L.*) *aeolopa* Meyrick; cocoons spun in leaves of green tea. 30. *L.* (*L.*) *virulenta* Bae & Komai; Japanese pear damaged by larvae. 31. *L.* (*Neolobesia*) *coccophaga* Falkovitsh; cocoons spun in leaves of *Lonicera japonica* (Thunb.).

in Fig. 6. Mandible (Fig. 9) with five teeth. Clypeus longer than wide. Adfrontals nearly extending vertical triangle. O1 equidistant from ocelli I and III; O2 ventro-caudal to ocellus I.

Thorax (Fig. 11). Prothoracic spiracle circular. SD1 usually equidistant from SD2 and XD2; L1 closer to L2 than to L3, slightly lower and longer than L2 and L3. D1 on meso- and metathorax usually slightly postero-dorsal to D2.

Abdomen (Fig. 11). SD1 on 8th segment anterior to spiracle. L1 and L2 distinctly anterior to a vertical line through spiracle except on 1st segment. SV groups on 1st, 2nd, 7th, 8th and 9th segments numbering respectively 3 : 3 : 3 : 2 : 2; SV3 usually antero-lateral

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and SV2 postero-mesal to SV1 on 1st and 2nd segments. D2 on both sides of 9th segment usually on the same pinaculum; D1 and SD1 on the same pinaculum; V1 about the same distance, apart as those on 8th segment. Spiracle rounded, moderately small; spiracle on 8th segment 1.5 times as large as that of 7th segment. Anal shield (Fig. 16a) rounded posteriorly in dorsal view, smooth, without spotted marking. L1 about the same distance apart as D1; anal fork (Fig. 16b) usually with 5 or 6 prongs.

Prolegs short, with crochets 35-37 in biordinal circule, anal prolegs with 25-30 crochets in partially uniordinal semicircle.

Material examined. 6 exs. Mt. Makiosan, Osaka Pref. (Y. S. Bae), feeding on *Lonicera japonica* Thunb., fixed on 5-14. VI. 1988, in UOP; 2 exs. Mt. Katsuragisan, Osaka Pref. (Y. S. Bae), feeding on *L. japonica*, fixed on 5. VI. 1988, in UOP; 3 exs. Mt. Inunakisan, Osaka Pref. (T. Yasuda & Y. S. Bae), feeding on *L. japonica*, fixed on 14. VI. 1988, in UOP.

Pupa (Figs. 24a-b, 25, 31). Length 6-6.5 mm; width 2 mm. Color uniformly yellowish brown. Structure as in normal tortricid pupae. Abdomen with two rows of spines dorsally, its posterior row weak on 2nd-8th abdominal segments as in Fig. 24a. Dorsal spines of the anterior row on 3rd abdominal segment between D1s with 5 or 7 serrate spines (Figs. 24a-b). Postero-lateral process large as in Fig. 25.

Material examined. 1 ♂ 3 ♀, Mt. Makiosan, Osaka Pref. (Y. S. Bae), reared from larvae on *L. japonica*, fixed on 14-17. VI. 1988, in UOP; 1 ♂ 1 ♀, Mt. Inunakisan, Osaka Pref. (T. Yasuda & Y. S. Bae), reared from larvae on *L. japonica*, fixed on 18. VI. 1988, in UOP.

Host plant. *Lonicera japonica* Thunb.

Remarks. The larvae of three *Lobesia* species closely resemble each other, but they are distinguishable by the following characteristics enumerated in table 1.

Table 1. Summary of the larval characters of *Lobesia* spp.

	L. virulenta	*L. aeolopa*	*L. coccophaga*
Body color	dark brown or black	light brown to dark brownish gray	yellowish green to light blue green
Prothoracic shield	dark reddish brown	dark reddish brown	yellowish green
Anal shield marking	present	present	absent
Anal fork	with 6 prongs	with 6-7 prongs	with 5-6 prongs
Crochets of anal prolegs	28-30	20-22	25-30

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摘　　要

日本産 *Lobesia* 属（鱗翅目，ハマキガ科）の幼生期（裵　良燮・保田淑郎）

Lobesia 属の幼虫は針葉樹から広葉樹まで広く食害し，ヨーロッパでは *L. botrana* ([Denis & Schiffermüller]) のようにブドウの重要害虫となっている種もある．日本でも *L. virulenta* Bae & Komai はナシの，*L. aeolopa* Meyrick は，チャ，キーウィ，ブドウなどの害虫となっている．また，*L. arguta* Bae & Komai はモミ属，トウヒ属，ツガ属などを加害する．

本稿ではこれまで幼虫および蛹について詳しい記載がなかった3種，すなわち *L. virulenta*, *L. aeolopa* および *L. coccophaga* Falkovitsh の終齢幼虫と蛹について詳細な記載を行った．

L. virulenta

幼虫：胴部の色は暗褐色または黒色，前胸背楯は赤褐色，肛上板には斑点が見られる．尾脚の鉤爪は28-30本で，尾叉は先端が6-7本に分かれている．針葉樹から広葉樹まで広く食する．

蛹：典型的なハマキガ科のタイプで腹部第3節背面の前方のD1刺毛の間に存在するとげ（dorsal spine）は4本，末端節の側面には突起がない．

L. aeolopa　ホソバチビヒメハマキ

幼虫：前種と非常に類似するが胴部の色は褐灰色または明るい褐色であり，尾脚の鉤爪は20-22本で前種よりやや少ないことで区別できる．多くの広葉樹を食する．

蛹：典型的なハマキガ科のタイプで，前種と非常に似るが腹部第3節背面の前方（D1間）のとげは5-6本．

L. coccophaga　スイカズラホソバヒメハマキ

幼虫：胴部の色は黄緑色または明るい青緑色．前胸背楯は黄緑色，肛上板には前種のような斑点は見られない．尾脚の鉤爪は25-30本で，尾叉は先端が5-6本に分かれている．食草はスイカズラの花や葉にかぎられる．

蛹：前種と類似するが，腹部背面のとげの形と尾端の形状は特徴的である．

幼虫の肛上板の斑点および蛹の腹部背面のとげの数と形は種を識別する点で，あるいは種内の系統関係を推定する点で重要な形質であると考えられる．

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